Dominating the Battlespace:

Filling Capability Gaps in Support of Joint Warfighters

LTG Larry J. Dodgen
Commanding General,
U.S. Army Space and Missile Defense Command/U.S. Army Forces Strategic Command

By LTG Larry J. Dodgen

The world has changed dramatically in the past decade, and our Nation's military forces have significantly changed in response. Concurrent with supporting joint warfighters engaged in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), our military capabilities are evolving to fight terrorism, meet nontraditional, asymmetric threats, and shape a defense structure better able to support and facilitate transformation. This broader focus, articulated in the recent Quadrennial Defense Review, released in February 2006, also requires capabilities to defend against traditional threats, conduct humanitarian missions at home and abroad, and help our Nation's allies and partners develop their own defense capabilities.[1]

To a degree not envisioned a decade ago, the lessons gained in ongoing combat operations and the impact of transformation have resulted in enhanced capabilities for our Nation's joint warfighters. Speed, power, precision and agility in "dominating the battlespace" have all been enhanced. Space-based capabilities, integrated as systems-of-systems, have been instrumental to this process. Former Vice Commander, Air Force Space Command, LTG Daniel Leaf, said, "Space … makes us more effective, more precise, and limits the tragic destruction that's inevitable in war."[2] Space assets have also enabled the conservation of combat power and saved countless lives. For example, Space assets have supported many of the more than 30 combat search and rescue missions conducted in Iraq.[3]

Once thought of as being restricted to the domains of land, sea and air, the current concept of the battlespace is defined as "the environment, factors and conditions that must be understood to successfully apply combat power, protect the force or complete the mission. This includes the air, land, sea, Space, enemy and friendly forces, facilities, weather, terrain, the electromagnetic spectrum and the information environment within the operational areas and areas of interest."[4] How the enemy perceives his environment and makes decisions based upon those perceptions are also part of the battlespace.

Dominating the battlespace demands superior knowledge and understanding about the battlespace beyond what the adversary knows and understands. The capability to sense, understand, decide and act more quickly than the enemy is fundamental to mission success. This capability enables commanders to make decisions and implement actions faster than an adversary can react, allowing combatant commanders to shape the situation, obtain the desired combat effects, and achieve the stated objectives. Space-based capabilities are critical to providing the relevant and timely information — actionable intelligence — needed to see, shape and dominate the battlespace. LTG Michael Hamel, commander, Space and Missile Systems Center said, "Information-centric warfare is becoming a critical center of gravity and Space has become the medium through which we enable information superiority for expeditionary operations."[5]

The Urgency of Defining the Gaps

Ongoing combat operations in Afghanistan and Iraq require the full range of our technological and tactical capabilities. Varied and powerful improvised explosive devices buried beneath and along roadsides or hidden inside innocu-

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The ongoing Global War on Terrorism and continued instability in multiple locations around the world necessitate the responsive delivery of capabilities in support of joint warfighters. Providing relevant support to our warfighters means furnishing capabilities enabling them to pursue the enemy around the clock. The operational requirement for responsiveness is now counted in seconds and minutes, not days, weeks or years.

ous objects and unattended vehicles complicate their early detection. Similarly, tracking individuals and groups of insurgents moving in complex terrain is complicated by their operation in small cells and their attempts to blend in with the local populace. The enemy's creative use of wireless communications combined with extensive use of Internet resources add further challenge to combating these enemies. Concurrently, adversaries attempt to counter our Nation's military strengths by attacking or exploiting perceived weaknesses, especially our dependence on Space-based command, control, communications, and computers, and intelligence, surveillance and reconnaissance capabilities. Requirements for points of access into theater, sustainment bases and transportation assets are also potential enemy targets.

During the early phases of OEF and OIF, satellite communications (SATCOM), early missile warning data, blue force tracking support, timely delivery of commercial imagery, forecasts of Space weather effects on SATCOM, and projections on the health of the global positioning system (GPS) and other satellite constellations were particularly vital. Army Space Support Teams supported the Coalition Force Land Component Commander, V Corps, 1st Marine Expeditionary Force, and the Office of the Coalition Provisional Authority by delivering Space products, services and expertise. The impact of these capabilities was significant, as noted in the following review: "The Nation's Space capabilities directly impacted speed of maneuver, the tempo of the fight and the boldness and lethality of our forces."[6] As an example, considering one area inextricably linked to Space-based capabilities, GPS, there have been more than 4,000 GPS-aided munitions expended in OIF.[7] Use of these munitions clearly has been instrumental in enhancing accuracy and minimizing collateral damage.

In an environment of insurgency, one might believe the value of Space is reduced; however, lessons provided by joint warfighters engaged in the Global War on Terrorism indicate the relevance of Space and its significance continues to grow. Focus, adaptiveness and innovation are required to ensure Space-based systems and products remain relevant to the current fight. Joint warfighters engaged in OEF and OIF require, in particular, robust capabilities in the areas of SATCOM, Intelligence, Surveillance and Reconnaissance, Blue Force Tracking and position navigation data. Space Support Elements, organic in the new Army modular formations, are instrumental to delivering and maximizing the use of these capabilities.

Combatant commanders require actionable intelligence to support military decision-making and operational missions. Battlefield information must be collected, processed into actionable information and rapidly disseminated to commanders who can use it to influence the battlespace. Multiple approaches are currently underway to provide it. A new concept called "Every Soldier is a Sensor," is being deployed to acquire raw on-the-ground data directly from Soldiers and then synthesize this information into a usable format for intelligence databases.[8] Supporting this initiative is the Commander's Digital Assistant, a small, handheld personal digital assistant that makes reporting quick and simple. The Force XXI Battle Command Brigade and Below (FBCB2) system allows Soldiers to digitize reports at the point of origin into a format that can be integrated at all levels. Space-based capabilities support the collection and transmittal of this electronic data. This focus supports the operational planning guidance provided by LTG Thomas Metz, former commander, III Corps, from his experiences in Iraq: "For every zero and one that streams down, think where else it needs to go."[9]

Combat operations conducted in mountainous terrain in Afghanistan and built-up areas in Iraq reduce the effectiveness of line-of-sight communications, which increases the operational demand for SATCOM down to the tactical level. SATCOM also pro-

vides the backbone for several Blue Force Tracking systems and new technologies, including unmanned aerial vehicles.

Over the past couple of years, a variety of unmanned aerial vehicles have been developed and fielded, contributing to the provision of immensely useful and timely battlefield information. However, the more than 750 unmanned aerial vehicles currently operating in Iraq and Afghanistan, of which approximately 700 are used by the Army, create significant bandwidth requirements.[10, 11] The Air Force estimates their fleet of unmanned aerial vehicles alone will triple in 2006, requiring a more than 350 percent growth in bandwidth, up to as much as 1 Gigabyte per second.[12] Viewing this in perspective, during Operation Desert Storm, coalition military forces numbered 542,000 and they had 99 megabits per second of bandwidth available. In OEF/OIF, bandwidth rose to 3,200 megabits per second, although the number of forces was reduced to 350,000.[13]

Operational Responsiveness: Delivering the Right Capability at the Right Time

The ongoing Global War on Terrorism and continued instability in multiple locations around the world necessitate the responsive delivery of capabilities in support of joint warfighters. Providing relevant support to our warfighters means furnishing capabilities enabling them to pursue the enemy around the clock. The operational requirement for responsiveness is now counted in seconds and minutes, not days, weeks or years. In commenting on the criticality of responsiveness, GEN James Cartwright, commander, U.S. Strategic Command noted: "Support must be assured. I need to be able to count on it when I need it. Otherwise, utility goes to zero."[14]

In addition to 24/7 planning cycles, planning windows have been correspondingly reduced. As recently noted by a combatant planner, "When you're after an elusive, high-value target, you've got to make every shot count."[15] Two examples illustrate the manner in which operational responsiveness is enhanced by Space-based capabilities:

- Attack on a Terrorist Safe House. On June 7, 2006, a GBU-38 Joint Direct Attack Munition was used in the air attack of the safe house used by Abu Musab Al-Zarqawi, the leader of al-Qaeda in Iraq and apparent mastermind behind hundreds of bombings, kidnappings and beheadings in Iraq. GPS and SATCOM were instrumental to the success of this mission.[16]
- Attack on a Terrorist Motorcade. In November 2001, a U.S. patrol near Kabul, Afghanistan, observed a motorcade suspected of transporting al-Qaeda fighters. The information was relayed via SATCOM to forces serving with U.S. Central Command. The motorcade was later engaged by U.S. military aircraft and a remotely controlled Unmanned Aerial Vehicles. The airstrike killed approximately 100 Taliban fighters and Mohammed Atef, a close associate of Osama bin Laden and the reported mastermind behind the 9/11 attacks.[17, 18]

Expansive demands for SATCOM and the capabilities that rely on it have led to the necessity of relying on civilian communications satellites to augment military SATCOM. In fact, during the early phases of OIF, approximately 80 percent of military communications were transmitted over commercial satellites. The growth in demand for military SATCOM has fueled significant expansion in the industrial-base Space and satellite market, which is estimated to reach more than $150 billion by 2010.[19] This reliance on commercial SATCOM is expected to continue at least until the Transformational Satellite Communications System comes on-line. The first launch of a Transformational Satellite Communications System satellite is currently scheduled for 2014.

Filling Capability Gaps in an Era of Faster and Leaner

The operational environment for our military forces during the next 20 years is expected to be even more complex than today's environment. The U.S. Joint Forces Command, in its annual review, *The Joint Operational Environment: The World Through 2020 and Beyond*, identified several conditions likely in the future operational environment: [20]

- Urban environments and other complex terrain will increasingly become centers of gravity;
- Potential adversaries will use adaptive responses to counter U.S. conventional military advantages;
- Campaigns and operations will have to account for a much broader battlespace that will extend well beyond the region of conflict. Regional crisis can quickly expand well beyond the boundaries of the affected region or the immediate cause of the conflict;
- Rapidly expanding global and regional information architectures, systems and organizations, both private and public, will have pervasive impacts;
- As the strategic center of gravity, the American Homeland will be increasingly targeted for direct and indirect attack.

As a strategic analysis of the future security environment, the 2006 Quadrennial Defense Review Report sets strategic priorities, identifies areas for needed investment and outlines the mix of forces and capabilities to fulfill the goals and objectives stated in the 2005 National Security Strategy. This comprehensive review also outlines the way ahead for the next 20 years, the period covered by the Joint Forces Command review, as our Nation confronts current and future challenges and our military continues its transformation in the 21st century. The Quadrennial Defense Review also aims to shift military capabilities to fight terror-

ism and meet other nontraditional, asymmetric threats, while shaping a defense structure that best supports and speeds up this reorientation.

Technological advances, increased access to information and globalization are likely to provide potential adversaries the capabilities to apply military force with greater precision, lethality, agility and survivability throughout the expanded battlespace. This expanded battlespace is also likely to be more non-linear than linear, more intangible than tangible, and more non-kinetic than kinetic. Defeating these adversaries will require detecting and tracking down low-signature targets, quickly identifying diverse behavior patterns and enabling timely decisions and actions. Operations will be conducted in a distributed manner over complex terrain and place a premium on integrated Space, air and ground sensors, and communication systems. Greater emphasis on Special Operating Forces capabilities will require more bandwidth and Space-based Joint Blue Force Situational Awareness.

Dominating the battlespace in the future operational environment will demand capabilities that enable high-tempo non-contiguous simultaneous operations, full-spectrum force protection, continuous situational awareness, non-line-of-sight lethality and precision fires. Capabilities in eight areas will be required to support the Future Force:

- Net-centric SATCOM, enabling seamless, integrated, dynamic bandwidth for battle command on the move;
- Assured, accurate, real-time early missile warning and integrated tracking distributed direct to affected forces and battle command systems;
- Responsive, tactically relevant Space control capabilities synchronized and integrated with land, sea, air and information operations;
- Persistent surveillance;
- Robust, precise, redundant jam-resistant position navigation;
- Advanced sensors for timely weather, terrain and environmental monitoring;
- Joint Blue Force Situational Awareness;
- Timely and accurate spectral imagery.

Support of these areas will likely require a mix of air, near-Space and Space-based systems, since no single system will be capable of supporting all mission requirements. However, two capabilities in particular show great promise for the support of Future Force warfighters: near-Space and tactical satellites.

Near-Space, defined as the altitude between 60,000 and 325,000 feet, will support a variety of platforms that will likely augment rather than replace air or Space assets. Platforms expected to operate in near-Space include those that provide capabilities in the areas of SATCOM, early warning, Intelligence, Surveillance and Reconnaissance and integrated fire control.

Once operational, near-Space platforms could also provide much needed persistence and direct support to theater commanders and their joint warfighters. Addressing the value of near-Space for pilots, GEN Lance Lord, former Commander, Air Force Space Command, noted: "At about 65,000 feet, balloons carrying communications receivers and transmitters can relay communications between air controllers on the ground and pilots in the air. The system allows pilots to receive information earlier in the 'kill chain' so they can remain focused on the mission and avoid problems from the ground. Another advantage is persistence over the theater. Near-Space gives warfighters the ability to continue flying over a certain area for a longer period of time."[21] The article by Michael Schexnayder in the Spring 2005 Edition (Volume 4, Issue 2) of **the Army Space Journal** contains an excellent discussion on "Near-Space Missions and Platforms." I encourage your review of this article.

To ensure a global responsiveness and the right mix in capabilities, it is equally important to consider the Space regime in addition to near-Space platforms. It is clear that near-Space capabilities provide the persistence required by tactical warfighters. The tactical Space regime is next in line for further exploration of the military utility to enhance global combat scenarios. Tactical satellites (TacSats) promise to provide capabilities to rapidly augment existing national Space assets, and rapidly deploy Space assets with payloads tailored to specific requirements of combatant commanders. TacSats could significantly increase persistent surveillance, precision targeting, communications, 360 degrees of situational awareness, dynamic tasking/retasking, as well as, direct tactical downlink of processed/actionable information. They will also provide increased persistence over areas of interest, so larger satellites will not need to be diverted from their primary missions.

Developed under the program "Operationally Responsive Space," TacSats will be placed into mission-optimized orbits upon demand in a low-cost manner, thereby delivering capabilities to joint warfighters around the globe faster than currently possible (reducing the time line from combatant commander call-up to on-orbit capability from 3-4 years to 5-7 days). TacSats will break the paradigm of a centralized control, to theater payload management, tasking and direct downlink to the warfighters who need the information within seconds-to-minutes of collection. Operationally Responsive Space also covers the development of launch vehicles, standardization of Space vehicles, modular interoperability, ground-based network integration and other technologies needed to make this vision a reality.[22]

The first tactical satellite, TacSat-1, is ready for launch but has been delayed. The TacSat-1 payload will consist of low-resolution visible and infrared cameras, a radio receiver package and connectivity with the Secret Internet Protocol Router Network (SIPRNet). Once operational, the satellite will be able to link with a variety of intelligence assets and unmanned aerial vehicles.[23]

Follow-on satellites, TacSat-2, -3, -4 and -5, are among a series of experimental Spacecraft designed to demonstrate new technologies and capabilities for providing responsive Space-based support direct to tactical forces.[24] TacSat-2 (a multi-spectral sensor payload) and TacSat-3 (a hyper-spectral sensor payload) are expected to launch, respectively, by November 2006 and September 2007. TacSat-4 has been recently selected as a communications payload that will provide additional communications capacity, data exfiltration and battle command on-the-move.

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Army Space Professionals at the Crossroads of Space

In 1921, General Giulio Douhet, the Italian air-power theorist, wrote: "Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur."[25] This insightful quote provides profound guidance for Space professionals engaged in ensuring Space-based capabilities are available in a responsive and reliable manner for joint warfighters.

Warfighters' operational requirements evolve over time and identifying how Space-based capabilities can support them is a continuous process. The law of unintended consequences holds that almost all actions have at least one unintended consequence. In other words, each cause has more than one effect, including unforeseen effects. Our reliance on technology may result in new vulnerabilities that we cannot currently envision. As we increase our technological strength, integrate systems, and build systems-of-systems, we must ask whether new vulnerabilities are being created. We may find it is significantly less complicated to field new technologies than to figure out what a determined enemy may do to survive its employment. As a result, we must ensure our strength cannot be neutralized by an enemy able to make it irrelevant on the battlefield. Our broader challenge is to ensure the focus remains on areas that support combatant commanders' operational requirements to dominate the battlespace.

As you read the articles in this issue of the Army Space Journal, I challenge you to focus on what can and should be done to leverage Space-based capabilities in support of our joint warfighters. As noted recently by General Peter Schoomaker, Chief of Staff, Army, "We now must cover a broader piece of the entire spectrum of operations, and because we have a force that is going to face challenges that will be dynamic and will move across the various challenges on the spectrum, we'll need people that are learning and adaptive."[26]

Secure the High Ground!

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